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Recommendations on Virginia Territorial Sea Trawl Mesh Size

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RECOMMENDATIONS ON VIRGINIA TERRITORIAL SEA TRAWL MESH SIZE

by

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The management principle behind the establishment of minimum mesh sizes on gear is to provide for the escapement of undersized fish. This has traditionally been resisted by industry as this practice allows a percentage of market sized fish to escape also. Studies on New England groundfish during the ICNAF (International Council of the Northwest Atlantic Fisheries) regime have demonstrated that the loss is short term as the larger mesh takes a greater percentage of larger fish and the smaller fish that escaped later enter the fishery at market size (Smolowitz, 1979).

Minimum codend mesh sizes are generally set to allow escapement of at least 50% of a given minimum size fish. The minimum size is established by market selectivity, age of maturity (which allows the fish to reach sexual maturity and spawn), or a size that provides a maximum yield per recruit. This later concept operates on the principle that very small fish, while growing rapidly are not efficiently harvested as they are small and many are needed. Very large fish on the other hand, while large are very slow growing and the population cannot be efficiently replaced.

At some point between the small but rapidly growing and large but slowly growing fish is a balance, and a maximum yield weight can be obtained from each fish, hence "maximum yield per recruit". This concept is best employed in a single species fishery, particularly when applied to trawling.

Table I depicts the maximum yield per recruit (YPR), age of sexual maturity, and Virginia minimum size limits for fluke, weakfish, and croaker, three species comprising a large percentage of the biomass of Virginia's coastal trawler landings.

The NMFS uses a relationship of "selectivity" versus length to determine minimum mesh sizes. The "selectivity" coefficient(c) is derived from exploratory trawling with various mesh sizes. The selectivity coefficients in Table I are derived from experimental trawling for winter flounder (Zawacki, personal communication) in New York, and cod and yellowtail founder in the Georges' Banks (Smolowitz, 1979). (A round disk, or dinner plate, would have a coefficient of 1.) As a fish's body elongates the coefficient increases. The weakfish is thinner than the cod so I have estimated a value of 4.0, slightly over the 3.6 for cod.

This coefficient allows us to select any size fish, plug in the coefficient and determine a mesh size that will allow at least 50% of the fish of that length to escape. The shortcoming of this technique is that in a mixed fishery the species will have different YPR values or different coefficients, depending upon body shape. This means for example that adult marketable butterfish or squid may be los in order to protect founder. North Carolina is considering a 4"mesh to protect the fluke resource, however this size will not retain butterfish and gills dogfish. In short, there must be a trade-off.

Table I provides the computed codend mesh sizes* (M) for the three Virginia species and it is obvious that to protect the fluke (YPR = 18") with a 9" mesh would be to destroy the weakfish/croaker fishery as most would escape through the net. Conversely a mesh size (2") that would allow escapement of only juvenile croaker would take even the smallest non-marketable fluke, a poor management alternative.

Based upon this, a compromise of a 6" codend mesh for a directed fluke fishery is recommended as it will allow escapement of up to 12" fluke and hopefully will not gill dogfish. A codend mesh size of 3" to 3-1/4" is recommended for weakfish and croaker or a mixed fishery as it will provide for retention YPR weakfish and 12" croaker. A 3 to 3-1/4" mesh (larger than the 2-1/2 - 3" mesh currently in use) will take however 6-8" fluke.

If the Commission opts for only one mesh size then I recommend 3-1/2" which will protect fluke up to 7-8" and weakfish and croaker to 13". A 4" mesh would be detrimental to the weakfish/croaker fishery.

*All mesh size refers to stretched mesh.

RECOMMENDED AND CALCULATED

TRAWL MESH SIZES FOR FLUKE, WEAKFISH AND CROAKER

	Age at sexual maturity Size	L Yield per recruitment (Va. min. size)	C Selectivity Coefficient	M* Codend Mesh size	Recommended Codend mesh
Fluke (summer flounder)	3 yrs (16")	18" - 4 yrs. (12" 2 yrs)	2	9" (6")	6"
Weakfish	2-3 yrs (11-13")	13" - 3 yrs. (none)	4	3.25"	3.25"
Croaker	2-3 yrs (10-12")	no Y.P.R. (8" 2 yrs)	4	2-1.7"	

Disk	1.00
Winter flounder	2.00
Yellowtail flounder	2.25
Cod	3.6
Weakfish	4.0-4.5**

* $M = \frac{L}{C}$

** Estimated

REFERENCES

Johnson, K. L. 1979. Yield per recruit analysis for summer flounder (Paralichthys dentatus). Lab. Ref. No. 79-34, NEFC/NMFS, 13 pp.

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Smolowitz, R. J. 1979. Mesh size and New England groundfish. Lab. Ref. No. 79-02, 75 pp.